AROUND THE LAB

Institute unites LLNL materials science efforts

Editor's note: This is the second article in an ongoing series on the Lab's research institutes. Today's article looks at the Materials Research Institute

By Elizabeth Campos Rajs
NEWSLINE STAFF WRITER

Materials science issues affect nearly every program and directorate at the Laboratory, but often, researchers are unaware that others onsite are grappling with some of the same issues.

Mike McElfresh, director of the Materials Research Institute in University Relations, is working hard to change that. Drawing on his background in industry, national labs and academia, he is striving to build an institute that will bring together researchers from throughout the Laboratory to talk about their common materials issues.

"Materials issues are an important part of nearly every program and every directorate at the Laboratory. This Laboratory probably spends more money on materials issues than anything else," he said. "Materials issues are the bottleneck of any technological advances. If you want to make anything bigger, smaller, stronger or weaker, it comes down to a materials issue. Materials are a big aspect of what is going on throughout the Laboratory."

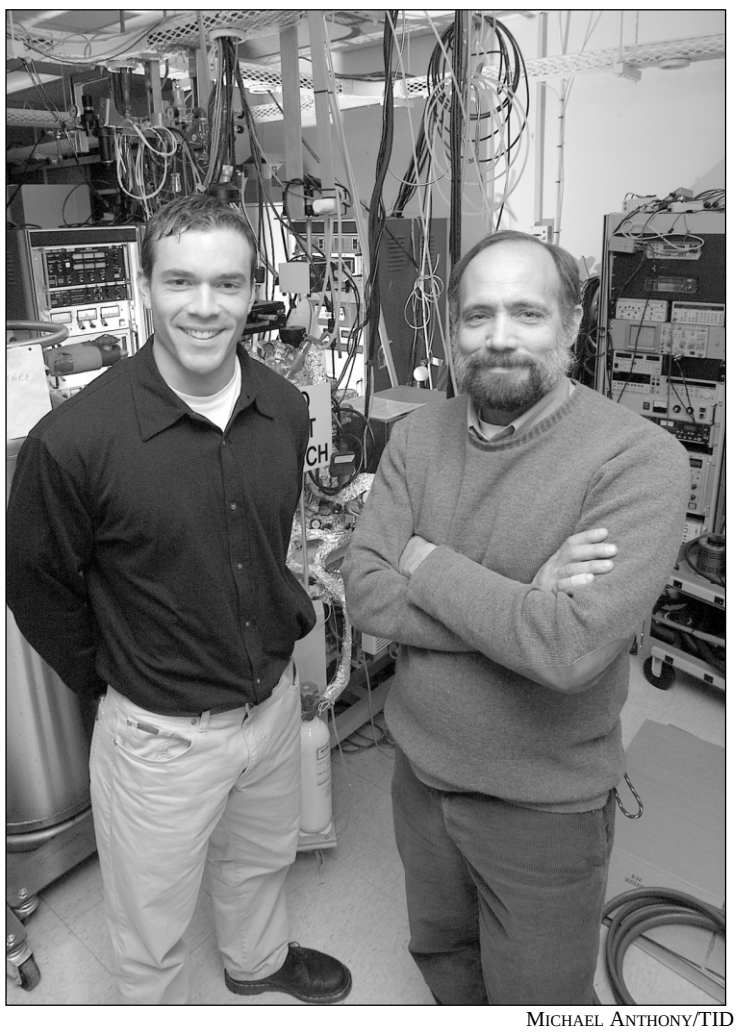
Materials scientists examine the properties of materials, including everything from strength and elasticity to how the properties can be altered to achieve a different result. Examples of research currently sponsored by the MRI include fundamental studies of laser damage in NIF-related optics and determining the structure of biomaterials interfaces using third-generation synchrotron-based X-ray diffraction.

The Materials Research Institute's primary goals are to both help make Laboratory researchers working in similar areas aware of each other and to couple Lab researchers with people at universities who can contribute their expertise and talent to the Laboratory, McElfresh said.

Since joining the Laboratory last May as the institute's director, McElfresh has held two in-house workshops on nanoscience and laser material interaction that were well attended and well received. He is now organizing follow-up discussion groups so that participants can continue meeting.

"People are spread out here at the Lab. We need to bring them together so they can talk," he said. "While I was at IBM research, we had the opportunity to congregate in a common lunch room everyday. I'm trying to make similar opportunities to congregate and talk possible here.

"I consider my job to be more of a facilitator of collaborations and internal communication. I try to help pull people together," said McElfresh, who came to the Lab from Purdue University. "I'm now going out and talking to people throughout the Lab one on one about collaborative research. I want to make the MRI really relevant to the Lab and Lab missions."



MICHAEL ANTHONY/TID

From left: Mark McCormick, a graduate student at Purdue University, works with Mike McElfresh on metal oxide research.

As director of the MRI, he oversees a portfolio of mini-grants with UC campuses to fund collaborative materials research with Lab scientists as well as some collaborations that extend beyond the UC system. The institute also hosts a weekly seminar series on Wednesday that is open to anyone interested in attending.

The Materials Research Institute, founded in 1997, is one of five University-Laboratory institutes that form a centerpiece of the Lab's research collaborations with universities. The other institutes are the Institute of Geophysics and Planetary Physics, the Institute for Laser Science and Applications, the Institute for Scientific Computing Research and the Center for Accelerator Mass Spectrometry.

Harry Radousky, acting director of University Relations, was the founding director of the MRI and held that position until McElfresh took over full time last May.

"The Materials Research Institute was started to give more cohesiveness to different aspects of the materials science at the Lab, and to provide a focus for presenting the Lab's outstanding work in materials science to outside universities and researchers," Radousky said.

The MRI is the newest of the institutes and has focused on the areas of optical and electronic materials; metals and organics; and biomaterials. It will be redefining its strategic directions to focus on the research umbrellas of nanoscience and materials under extreme conditions.

"We want to focus our portfolio of collaborations to those two primary areas. I want to maximize the institute's impact on the Laboratory," McElfresh said.

In a couple of weeks, the MRI will launch a new graduate fellowship program, in collaboration with the Energetic Materials Center. The program will provide funding for a graduate student to work in collaboration with a Lab scientist and university professor on a technologically relevant basic science problem. In this case, the basic problem is related to energetic materials. The first three projects will link three Lab researchers with professors and graduate students from Harvard, MIT and UC Irvine.

"The student serves as the glue in the collaboration," said McElfresh, who had a similar experience while working on his Ph.D. He served as the link between a professor at UC San Diego and Los Alamos National Laboratory, residing in Los Alamos for nearly three years. He also worked with LLNL physicists in H Division, and was one of the first students supported through the LLNL branch of IGPP.

"A Lab researcher identifies a university professor they want to collaborate with and the professor identifies a student to work with them both. It has to be a basic science project so that the student can work on his or her thesis, but we want it to have relevance to the Lab's mission. We fund the student for the research portion of his or her thesis," McElfresh said. "We want the students here as much as possible."

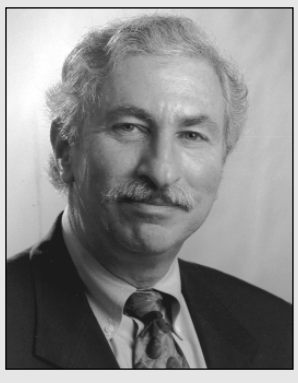
Plans are also under way within the MRI for a summer institute for computational materials science and chemistry. Eight students will be invited to work at the Lab for eight weeks alongside a researcher. Giulia Galli, Larry Fried and Vasily Bulatov are the scientific directors of the institute.

The summer program will also feature a series of mini-courses offered by outside speakers at the Department of Applied Sciences. Those talks will be open to any interested Lab employees as well as people from neighboring universities, McElfresh added.

DDLS presentation to focus on biomaterials that heal

Buddy Ratner, professor and director of the University of Washington's Engineered Biomaterials program, will present "Biomaterials That Heal: Research Into Surface Control of Biology," at 3:30 p.m. Thursday, Feb. 8, in the Bldg. 123 auditorium.

Ratner's presentation is part of the Director's Distinguished Lecturer Series. Director Bruce Tarter invites all employees to attend.



Buddy Ratner

More than a half billion medical devices, ranging from catheters to heart valves and artificial hips, are implanted into patients every year. While these devices save or improve the lives of millions of people, they sometimes offer only temporary fixes. The body's natural response to foreign material is to wall it off with scar-like tissue. Frequently, this reaction disrupts the implant's performance and calls for further medical intervention.

Ratner's team has devised sophisticated processes for coating artificial materials so that their surfaces can attract and bind specific proteins, which promote normal healing. For example, in tests using proteins of similar sizes, only those proteins with the appropriate shape and chemistry adhered to the coating.

The University of Washington Engineered Biomaterials program is a National Science Foundation Engineering Research Center, directed by Ratner. Its research program centers on the creation of new biomaterials, understanding their surfaces and their interactions with biological systems. Ratner will discuss his philosophy for the design of such materials.

"We've achieved, using relatively ordinary synthetic materials, the highly specific 'lock-and-key' fit we see in natural healing," says Ratner.

"The next step is to see if an implant coated using our process actually 'turns on' healing in the body."

In 1998, Ratner received the Charles M.A. Stine Award in Materials Science from the American Institute of Chemical Engineering. He is a fellow of the American Institute of Medical and Biological Engineering, the American Vacuum Society, and the Society for Biomaterials.

Ratner's lecture will be broadcast on Lab TV channel 2 Thursday, Feb. 15, at 10 a.m., noon, 2, 4, and 8 p.m., and Friday, Feb. 16, at 4 a.m.